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ABSTRACT

Three evaluations were conducted to try to pinpoint the cause of the difficulties of a 23-year-old black male, who was highly gifted in mathematics but hampered by a second grade reading level, displayed difficulty in focusing his eyes together, spoke as if trying to avoid stuttering, and did not maintain eye contact. A neurological evaluation revealed a left hemisphere brain dysfunction affecting verbal abilities, while a perceptual evaluation revealed a refractive error and binocular instability. Educationally the subject proved to be handicapped by poor preparation and inadequate vocabulary, but scored well in solving pattern recognition and logic problems. First the eye problems were corrected, and then a remedial program, based on the evaluators' recommendations, was designed to teach reading and writing through a mathematical approach. The program which allowed the student to control his learning as much as possible by providing him with achievable goals and procedures, proved effective. The student improved his social interaction with people, broadened his range of interests, showed marked growth in reading level and writing ability, and began studying for a Master's degree in electrical engineering. (RBW)

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ED251791

# "A B+ AVERAGE IN ENGINEERING WITH A SECOND GRADE READING LEVEL"

presented at EERA
EASTERN EDUCATIONAL RESEARCH ASSOCIATION
KIAWAH ISLAND, SOUTH CAROLINA
1979

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INTRODUCTION

Individuals who have difficulty learning to read are often highly talented in other areas. One way to help these individuals become proficient readers is to enable them to apply their special abilities to reading. The following is a presentation of how this method was used with one student, KC, a 23 year old black male, who is highly gifted in mathematics but was being hampered in his educational progress by a second grade reading level.

BACKGROUND

KC's mathematical ability was recognized by the Philadelphia Board of Education and the Engineering faculty at Drexel University when he attended a university sponsored summer program for high school students. He subsequently enrolled at Drexel as an electrical engineering major and maintained a B+ average in his engineering work. However, all work was done orally, and by his third year KC had not taken the liberal arts courses required of engineering majors or other courses requiring reading and writing. Since KC had not progressed in the remedial services offered by the Board of Education and by Drexel, it was a virtual certainty that he would fail any such courses.

EVALUATION

The following behaviors, exhibited by KC during the initial interview, indicated the necessity of enlisting the co-operative efforts of several specialists to diagnose his difficulty. KC appeared to have difficulty focusing his eyes together, postured himself awkwardly with his body turned inward, and spoke as if trying to avoid stuttering. There was also no eye contact. These behaviors led to the decision to have KC evaluated neurologically, perceptually and educationally.

Since this report focuses on the educational aspect of KC's progress, the educational evaluation will be presented in detail. However, first, to enable a fuller appreciation of KC's problem, the neurological and perceptual

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evaluations will be summarized (see appendices A, B and C for the complete reports).

In an attempt to get as much information as possible a neurological evaluation, a Gebrands Tachistoscope for lateralization of cerebral function was done to test which hemisphere is dominant for spatial functions and which is dominant for berbal functions. The suggested conclusions were that in KC's case, the right hemisphere is dominant for spatial functions. Therefore, it would be expected that the left hemisphere would be dominant for verbal functions. Due to a left hemisphere dysfunction, however, KC's right hemisphere is also dominant for verbal functions. Further, though KC's right hemisphere processes verbal material, it does so in more than twice the normal amount of time.

The perceptual evaluation examined KC's ability to learn through his visual, auditory and motor modalities. It concluded that KC relies primarily on vision for learning although, at the time of the evaluation, this modality was handicapped by a refractive error and binocular instability. Auditorially, KC exhibited reversals, poor short and long term memory, and difficulty with word retrieval. Motorically, fine motor difficulties pervaded all aspects of KC's movement. The examiner noted that his problem was directly related to eye teaming difficulties, skill and efficiency in pencil use and stuttering. Because of these findings, KC participated in an optometric visual therapy program concurrently with his participation in the educational program designed for him. (Appendix D)

The educational evaluation, performed by an independent team of evaluators, was not confined to KC's reading performance. It also assessed KC's vocabulary, language usage, and approaches to problem-solving. Since it allows for discovering an individual's abilities in areas other than reading, this type of evaluation is consonant with the goal of designing a remedial reading program which can tap these abilities.

KC's greatest strength was in solving pattern recognition and logic problems - exercises which require the discovery and/or systematic application

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of rules. However, in more complicated problems, he did not record the information. Rather, he tried to keep all of the variables in his mind. Several times this caused him to lose track of his progress towards a solution though he eventually solved all problems after being consistently prompted to keep a record of his progress.

KC's poorest performance was in the language related areas. He scored a 105 in the Peabody test, average, yet not congruent with his other abilities. On a test which required him to give synonyms, he often gave words which had similar meanings but were unlike the cue words in that they were different parts of speech.

When given a 6th grade passage to read, "First Kill," KC was unable to get through any sentence without making several errors. Further, there was no consistency in the types of errors he made. He made graphic, syntactic and semantic errors. In repeating a section of a sentence, he was as likely to make an error as not. At times, he repeated a section of a sentence when he had made no error initially. KC's reading of this passage indicated that he had not yet attained an approach to print characteristic of the beginning reader, i.e., attention to graphic information. The evaluators estimated that KC was reading at the 2nd grade level.

This evaluation and the initial tutorial sessions indicated that, in addition to perceptual and neurological factors, there were other reasons for KC's language and reading difficulties. KC's early educational preparation was poor. Because of an inadequate vocabulary, KC often had difficulty applying word-attack skills. Though he could break words into syllables and apply them, he often applied incorrect stress. This happened with words which by his own acknowledgement he did not know, e.g. "California," "Nevada." KC's own assessment of early education is that the teachers' spent "half the time telling us how bad we were and the other half sending us out to recess."

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KC uses the black dialect. He drops his plurals and verb tense endings. The dialect does not seem to interfere with his attainment of meaning in reading. However, it did interfere with his writing. By the prescriptions of standard English, his writing was replete with grammatical errors. At least 90% of these were related to pluralization and tense.

Finally, and perhaps because of his brightness, KC exhibited impatience with tasks he could not perform or solve instantaneously. He grasps concepts quickly; one is tempted to state that he sees mathematical ideas intuitively. Yet, this same ability made him impatient with procedures which can be helpful and at times necessary in other endeavors. He tended to see such procedures and their accompanying requirement of attention to detail as irrelevant. This behavior influenced his reading. He read by focusing on key words. If what he read made sense, fine. If it did not make sense, he attributed the meaninglessness to the written material and not to his reading.

PLANNING INSTRUCTIONAL REMEDIATION

The perceptual and educational evaluations combined with the initial tutorial sessions provided the information necessary to planning KC's remedial instruction program. Specifically, the following provided guidance in determining the best procedures to use with K.C.

- KC had both ability in and respect for disciplines related to mathematics and logic. He did not have respect for language and language related disciplines. To engender this respect, his remediation needed to be approached via disciplines he respected, mathematics and logic.
- KC's disregard for details he considered irrelevant had to be replaced by a willingness to apply systematic

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procedures to reading. This was especially necessary because his reading performance showed consistant disregard for the text.

- Although KC had visual problems, his perceptual strength was visual, his perceptual weakness was auditory. The program needed to build through the visual modality while remediating the auditory deficit.

One aspect of the remedial program was not specific to KC. As it would be for any learner, the program was designed to enable K.C. to control his learning through the use of self-corrective procedures.

THE REMEDIATION

To enable KC to appreciate that language, like mathematics and logic, has structure and rules, he was introduced to three games, "Master Mind," "Master Word" and "Queries n' Theories." "Master Mind" requires the player to deduce a sequence of colors established by the opponent. "Master Word" substitutes words for sequences of colors. In playing "Master Word," the player is additionally constrained by the rules of English orthography. Playing this game allowed KC to realize that such rules exist and to make explicit his implicit knowledge of these rules. "Queries n' Theories" requires the player to deduce the rules by which one sequence of colors can generate another sequence of colors. "Queries n' Theories" is an analogue to transformational grammar. It thus served as a basis for introducing KC to the study of transformational grammar, a type of grammar which is akin to mathematics in its structure. These initial sessions both motivated KC and enabled him to acquire rules of spelling and grammar which were to be useful to him as he progressed in reading and writing.

The introduction to games occurred at the beginning of KC's remediation. Having enabled KC to acquire a respect for language, the next step was to

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have KC attend to graphic detail and apply systematic procedures to reading.

For these purposes, the talking typewriter was used. Special courseware was developed for KC. The basic principles guiding this courseware development and examples of the way these principles were developed are listed below:

| Principle | Example |
|---|---|
| 1. Retain rule emphasis approach | Program explaining rules of syllabification. Program explaining spelling rules |
| 2. Provide sufficient intellectual challenge | Exercises involving formulation of rules for syllabification from examples. Exercises in generating examples from rules. |
| 3. Utilize strength of visual modality | Present rules on slide projector as diagram algorithms. |
| 4. Emphasize larger units for word analysis, not small units as KC had difficulty in discriminating small units of sound | Spelling rules introduced through linguistic word groups. Emphasis on syllabification. |
| 5. Force use of verbal short term memory | Presentation of sentence anagrams, i.e., lists of words which had to be arranged in sentences and held in memory long enough to type. |
| 6. Force attention to graphic information. | Require typing as part of above procedures and the reading of what is typed. |
| 7. Allow for opportunity to read fluently. | Presentation of words and sentences to be read and recorded. Opportunity to reread until read fluently. |

By using the talking typewriter, KC developed the habit of paying attention to text, acquired word analysis skills appropriate to his perceptual strength, and practiced retaining language in short term memory. To progress from this point, it was necessary for KC to develop fluency. The procedure developed for this purpose involved the use of a voice-mirror. The voice mirror, essentially a tape-recorder with an immediate playback, allowed KC to use a self-corrective method while developing fluency. The procedure is given below:

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Procedure to be used with Voice-Mirror

1. Hold the book on your left

2. Read each sentence recording into voice mirror

3. Listen to the sentence using a pencil to point to the words as you listen

4. Underline the words which you cannot pronounce or the words which are confusing the meaning

   A. If the word is long and unfamiliar to you, do the following:

      1. Write the word down
      2. Break the word into parts: try several different ways:
         Hints: Look for words inside the word
         Use rules for making syllables. Try to read word
      3. Look the word in dictionary
         a. Use symbols in front of dictionary for pronunication
         b. Look at stress markings
         c. Write down word into syllables as it is in dictionary
         d. Work on pronouncing word until you have it; use VM (Vice-Mirror)
         e. If in doubt, ask someone to pronounce the word
         f. Read the dictionary definition of the word
         g. Read the word in the sentence
         h. Relate the meaning of the word to the way it is used in the sentence

   B. If the word is a short word or may be a short word,

      1. Look at the first letter of the word
      2. If that doesn't work, write down the word and look at it
      3. If 1 and 2 doesn't work, write down all of the short words in the sentence in the order in which they appear. Read them

5. Even if sentence does make sense, read it and read it until you can read it fluently

6. Reread the paragraph until you can read it fluently

7. Do exercises

8. Reread the paragraph fluently

9. Remember to stop at periods

Within one week of using this procedure, KC was able to achieve fluency in readings. During one session, he read 6 passages graded at levels 7, 8, 9, 10, 11 and 12. The second reading of each passage consisted of only two or three errors and some of these were errors which retained meaning. The procedure

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allowed him to develop the fluency necessary to the retention of meaning.

One other technique was introduced to enable him to read fluently. It allows him independence from the voice-mirror and is a quicker procedure. He used a 3x5 index card to cover all words in the text except the one he was currently reading. As he read, he uncovered the word. This allowed him to focus on graphic information and also simplified his visual field. This technique was introduced well after his work with the voice-mirror. It was introduced because of his erratic reading performance. During some sessions, KC retained the fluency he had developed with the voice-mirror. During other sessions, his reading deteriorated. The procedure was introduced so he could use it during those times.

There may be an explanation for the inconsistency in performance. KC often came to sessions with a high carbohydrate, high sugar snack. His deterioration in reading usually occurred after he had eaten such a snack. It is possible that allergies to certain foods contributes to KC's difficulties. A nutritional evaluation should be performed to confirm or eliminate this possibility.

Up to this time, KC's remediation had focused on the mechanics of reading. However, this focus had not precluded content. Throughout, KC had been exposed to intellectual content and challenge by being made to work with language as a system of rules. The next phase of remediation emphasized reading for meaning.

Once again, an attempt was made to link the reading to KC's mathematical background. G. Polya's How To Solve It was used as the basis for the sessions in this phase. Polya presents a series of heuristic questions to guide mathematicians in solving problems. KC used these questions in reading passages from a Graduate Records Examination practice book and in answering the questions about these passages.

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This technique helped KC in several ways:

- It helped KC to overcome his propensity for dismissing as irrelevant ideas that were either difficult or with which he did not agree
- It helped KC to focus on the internal structure of sentences and paragraphs and to relate this internal structure to the intended meaning, e.g., words or phrases which mark transitions between ideas, "But", "even though".
- It helped KC to distinguish between reading for what is explicitly stated and reading for implications. It also allowed him to separately consider his own inferences about what was written from what was actually written.

The result of these exercises was that KC was able to independently read and correctly answer the majority of questions about passages fron the GRE* practice book. Although this was not the primary purpose of the procedure, it is an important consequence for KC's future. He intends to go to graduate school. If his initial verbal score of 200 on the SAT** (a score achieved merely for writing one's name) were to be duplicated on the GRE's, his chances for achieving this goal would be negligible. However, his work during these sessions indicate that his SAT performance will not be duplicated on the GRE's.

In addition to using the Polya procedure, KC practiced prediction while reading. He would be stopped in the middle of a sentence and asked to complete the idea. Or, he would be stopped between paragraphs and asked to predict the contents of the next paragraph. Instead of using technical material for these exercises, short stories were used. As he became adept at predicting, KC began to appreciate that literature as well as science and math had a structure. This was the second time that he had expressed an appreciation for the idea that there was structure in other areas aside from mathematics and science. While studying transformational grammar, he stated that he had realized that there was structure in art. This comment precipitated a trip to the Philadelphia Art Museum. Although KC had lived within a half-hour bus ride to the museum all his life, he had never visited it. He would often make humorous comments about what

* GRE = Graduate Record Exams
** SAT = Scholastic Aptitude Test

was coming next, a strong indication that he was understanding the material. It should be noted that KC's sense of humor began to express itself as the sessions progressed. Initially very serious, as he began to know the tutor and gained confidence, he more frequently made understated but delightfull wry comments.

The final phase of KC's sessions concentrated on writing. He was very strong in the logical department of ideas. However, his grammar and spelling were inadequate. Heuristic procedures were introduced to help him in these areas. The procedure for grammar was as follows:

- Review the sentence written. Underline nouns and verbs.
- Use algorithms developed while studying transformational grammar to check for

  a) noun-verb agreement
  b) verb tense ending

Since the majority of errors KC made were in noun-verb agreement and verb tense endings, this procedure enabled him to correct most of his errors. It is ironic that the necessity for underlining nouns and verbs care about because by this time KC was reading in standard English but writing in Black English. If he did not underline the nouns and verbs, he would not have perceived his errors.

A procedure was also developed for spelling. KC was able to use this procedure because he could identify when he misspelled a word. It is here, also, that his previous work in spelling proved very useful. The procedure is as follows:

- Write down the word misspelled
- Count syllables by tapping out with fingers
- Underline the letters which you think are wrong
- If a vowel/vowels, substitute other vowels or vowel blends
- Choose the spelling which "looks" right

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- If a consonant or consonant cluster, substitute with other consonants or consonant clusters which have the same sound
- Choose the one which "looks" right
- Only if still uncertain, check in dictionary

Though these procedures did not make KC's writing totally error-free, they reduced his errors to such an extent that his writing began to appear literate. Further work on small words, "an", "of", etc., eliminated most of his other errors. The procedure is admittedly tedious, and at times, KC grew impatient with it. However, when he uses it, it is effective. As he practices writing, it is hoped that he will no longer need it.

Though the sessions have been described as being divided into phases, it must be stated that there was more to them than what has already been described. Partially because of the tutor's interest but lack of ability in math and science and partially to allow KC to obtain the sense that he was giving as well as receiving, each session included a discussion of these areas. In effect, during these parts of the sessions, KC became the tutor. As is stated below, one of the principles guiding the sessions was to allow KC to control his learning. This switching of roles also allowed KC to assume the guiding role in his relationship with the tutor.

CONCLUSION

Before discussing the outcome of the KC's tutoring program, it will be helpful to emphasize the guiding principles behind their design:

- The first guiding principle was discussed earlier; teach reading and writing through a mathematical approach. The ways in which this was done has been described throughout.
- The second guiding principle was to allow KC to control his learning as much as possible. The crucial necessity here was to provide KC with a goal and with procedures which would allow him to attain that goal - the procedure had to allow him to perceive error when he was being deflected from the goal. Algorithms, heuristics, the talking-typewriter, and the guidelines used for the voice-mirror, each of these were used with this second principle in mind.

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KC progressed in several areas which are listed below:

- He changed in his social interaction with people. Previously withdrawn, he began to initiate conversations, initiate and maintain eye-contact, and engage in humorous banter. This change was noted not only by the tutor, but also by the secretaries and administrators in the College of Engineering.

- His interests widened. Initially respecting only mathematics and science, he became involved with language, literature, art, psychology. It should be noted that as he expressed interest in these areas, it also became evident that his talents were not confined to mathematics and engineering. During the course of one conversation about psychology, he stated, without knowing about them, the principles of both Jean Piaget and Herbert Simon.

- His progress in reading became evident during the sessions, both in the GRE material and the literature that he read. Additionally, he was given an Informal Reading Inventory in March, 1979, 10 months after his tutoring began. He was able to answer all comprehension questions except for two up to the eight grade level, the highest level of the test. Although there were still reading errors, 3 or 4 to a passage, most of these did not change the meaning. As the comprehension results show, they did not interfere with his attainment of meaning.

- In his humanities course, a couse in writing, at Drexel, which he took only eight months after the remediation program was started, KC received a B. He wrote and corrected the compositions himself using the above procedures.

The program developed for KC was compensatory. It may be that he will always have to rely on the techniques developed when reading and writing. It may also be that with time he will be able to forego them as his reading and writing becomes automatic. At this point, two recommendations are made:

- A nutritional evaluation to determine if food allergies trigger difficulty in reading and writing performance

- A continuation of practice to allow KC's reading and writing to become less dependent on the techniques developed for him

## A RETROSPECTIVE VIEW

Although KC made significant progress in retrospect, there are some aspects of his instruction that might have been done differently.

- Earlier attempts at reading for meaning. This would have forced KC, at an earlier point in the program, to relate the structure of language to the meaning that structure conveys.

- Stricter insistence upon a daily 20 minute practice session. As with any other skill, reading requires short but continuous practice. KC's occasional lapses in practicing may have been partially responsible for his sometimes erratic reading performances.

Also in retrospect, it is felt that the initial decision to base KC's program on his special abilities was the crucial one in enabling him to acquire the reading and writing skills necessary for him to function. This was crucial in terms of motivation, a factor sometimes ignored in remediation, crucial in establishing self-corrective procedure to enable him to control his learning, and crucial in structuring the content which he needed to learn.

This story has a very successful ending. Today KC is employed by Bell Labs and receives financial support to pursue a Master's Degree program, half-time, in Electrical Engineering at the University of Colorado in Boulder.

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APPENDIX A

Learning Disabilities Center

DIAGNOSTIC CLINIC AND EDUCATIONAL HABILITATION

DR. MARTIN KANE, Director

6137 RIDGE AVENUE
Philadelphia, Pa. 19128
(215) IV 3-9300

May 18, 1978

ean Richard Woodring
ollege of Engineering
rexel University
2nd & Chestnut Streets
hiladelphia, Pa. 19104

ear Dean Woodring:

A Diagnostic Developmental Evaluation was performed with on May 16, 978. The following pertinent data is submitted for your information.

ISUOMOTOR EXAMINATION

The internal and external portions of the eyes and adnexa were normal and free of pathology.

Pupil reflexes were normal in each eye. Pupils were symmetrical.

Color vision was normal. Number reversals were noted.

Binocular coordination tasks in a telebinocular and stereoscope revealed occasional suppression of the right eye and/or double vision at near. All other binocular coordination tests demonstrated similar problems.

Accommodation was normal in each eye at near.

Visual acuity without corrective lenses in right eye was 20/40; left eye, 20/30+.

A moderate degree of astigmatism was found in each eye. A greater refractive error was noted in the right eye.

A vertical imbalance of the eyes was noted. This vertical imbalance was also apparent in a head tilt to the right and the left shoulder postured higher.

ummary: A great deal of stress is apparent in all visually related tasks. Corrective nses are necessary for the refractive error. Visual training will be needed to rrect the binocular coordination anomalies and to permit efficient visual information ocessing.

UROMOTOR EVALUATION

Hand/eye coordination for motor memory was inadequate.

Fine motor problems were apparent in finger control, use of a pencil and eye movements.

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3) Slight articulation problems and inadequate voice control was noted.

4) A slight curvature of the spine was apparent. (This finding is related to the vertical imbalance demonstrated with the eyes, head and shoulders; it creates a general postural imbalance.)

5) Constriction in the lower torso and legs inhibited free movement flow and expression.

Summary: Fine motor difficulties pervade in all aspects of movement. This problem is directly related to eye teaming difficulties, skill and efficiency in pencil use and stuttering.

PERCEPTUO/COGNITIVE FACILITIES

1) K scored 80 out of 100 points in the Kane "Perceptuo/Cognitive Protocol." This score demonstrated total perceptuo/cognitive skills consistent with an eight year old child.

2) The score in auditory processing was 60% efficient. Auditory reversals were consistent throughout the evaluation. Auditory memory was poor for short term tasks. A major word retrieval problem for short and long term memory was apparent.

3) The score in visual processing was 9?% efficient. Difficulty in integrating parts into whole concepts was noted. Color reversals were exhibited.

4) The score in motor processing was 75% efficient. Fine motor problems and motor reversals were noted. Inadequate closure was demonstrated. Drive for mastery in tasks that King deemed irrelevant was most evident.

Summary: K depends very heavily on his visual modality for learning. This dependency upon the visual system was apparent in test data and in discussions with him about his learning style. This modality, upon which he relies, is handicapped with a refractive error and binocular instability.

CONCLUSIONS

1) Strengths

Visual system for learning
Right hemispheric functioning ability:
divergent thinking, holistic, inductive, spatial, creative, symbolic, linear, sequential, non-verbal
High performance ability
Ability to structure self
Desire to do well in tasks that are of interest

2) Weaknesses

Low verbal ability:
demonstrated in all speech, auditory and language skills
Poor short term auditory memory
Word retrieval

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Left hemispheric functioning ability:
convergent, parts awareness, deductive, labeling skills, grammatic logic, verbal memory, details, verbal ability
Reversals
Disregard for information that appears trivial and irrelevant

3) An optometric visual therapy program would be extremely helpful to assist King in developing competencies in problem areas.

Respectfully,

Martin Kane, O.D.

MK/es

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DREN'S
PITAL

ADELPHIA
1855

LDREN'S CENTER
EET AND
ENTER BOULEVARD
ELPHIA, PA. 19104
V 7-6000

April 24, 1979

Re: K C

This is to certify that K C was tested on a Gerbrands Tachistoscope for lateralization of cerebral function. The tasks measure which hemisphere is dominant for verbal function, and which is dominant for spatial function. Degree of accuracy is taken into account as well as the amount of time required by the subject to process the information and achieve a certain degree of accuracy. The results for K C were as follows.

SPATIAL TEST. On this test the right hemisphere performed with much greater accuracy than the left, and the amount of time required was within normal range.

VERBAL TEST. Since the right hemisphere was dominant for spatial functions, we would expect the left hemisphere to be dominant for the processing of verbal material. However, in this case the right hemisphere showed greater accuracy, while the time he required to process the information was much greater than the average amount.

INTERPRETATION. People with right hemisphere language are often able to perform within normal range, and their speed and efficiency do not deviate significantly from the average shown by people with left hemisphere language. In this case the right hemisphere is the appropriate hemisphere for the processing of verbal material, and is not, under these circumstances, being activated as a result of some left hemisphere dysfunction. However, since K C required so much time (more than twice the expected amount) it seems likely that, due to some left hemisphere dysfunction, his right hemisphere is being forced to assume the processing of verbal material, in spite of its inability to do so efficiently.

Testing date: January, 1979

Wendy Heller

Psychologist
Children's Hospital of
Philadelphia



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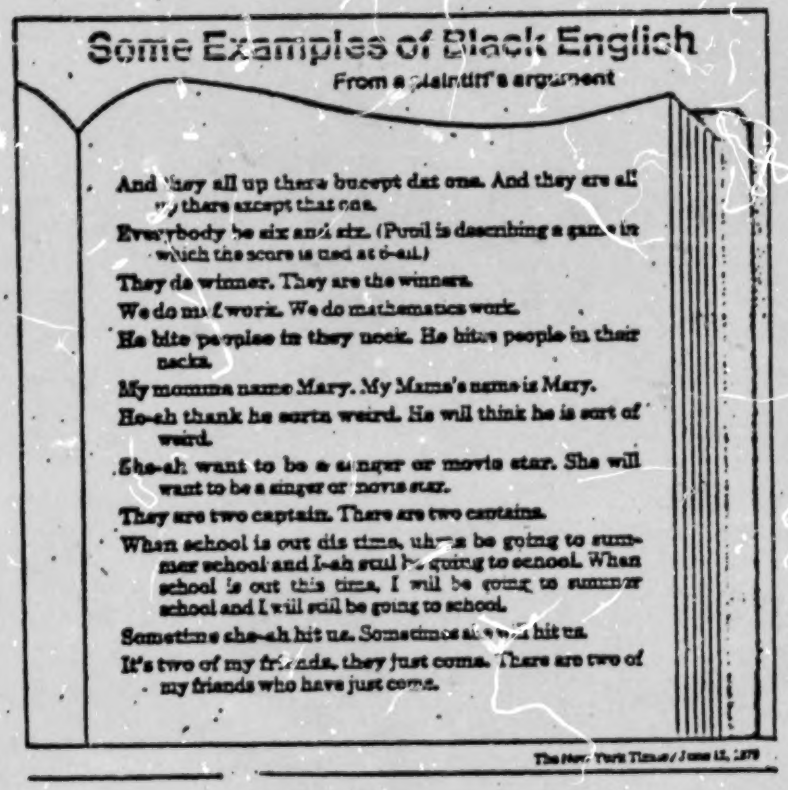
APPENDIX C



## Some Examples of Black English

From a plaintiff's argument

And they all up there bucept dat one. And they are all up there except that one.

Everybody be six and six. (Pupil is describing a game in which the score is tied at 6-all.)

They de winner. They are the winners.

We do mathwork. We do mathematics work.

He bite people in they neck. He bites people in their necks.

My momma name Mary. My Mama's name is Mary.

He-eh thank he sorta weird. He will think he is sort of weird.

She-eh want to be a singer or movie star. She will want to be a singer or movie star.

They are two captain. There are two captains.

When school is out dis time, uh-uh be going to summer school and I-eh still be going to school. When school is out this time, I will be going to summer school and I will still be going to school.

Sometime she-eh hit us. Sometimes she will hit us.

It's two of my friends, they just come. There are two of my friends who have just come.

The New York Times / June 12, 1979

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## REFERENCE

(1) Polya, G. How To Solve It: a new aspect of mathematical method, Princeton University Press, Princeton, New Jersey, 1971.

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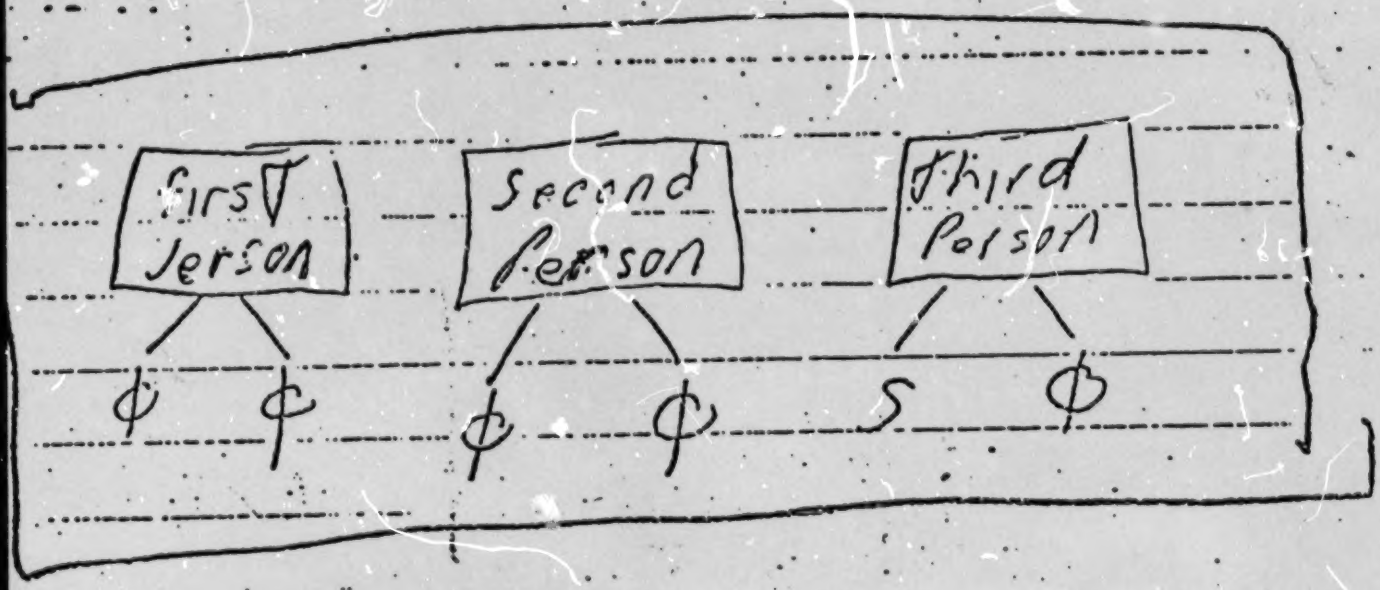
APPENDIX F

ALGORITHM DEVELOPED BY KC

AGREEMENT OF NOUN AND VERB
PRESENT TENSE

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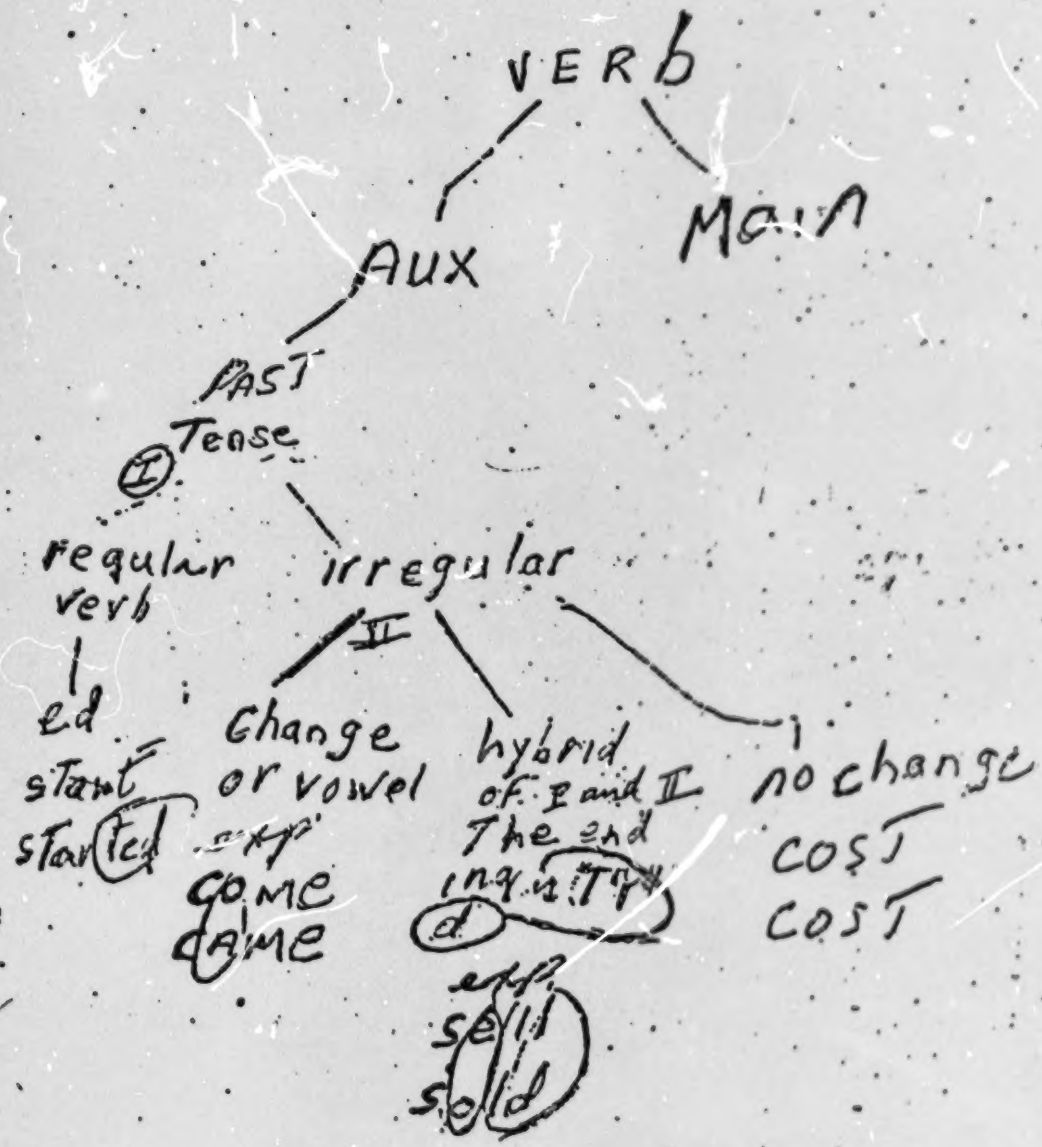
ALGORITHM DEVELOPED BY KC
PAST TENSE FORMATION

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EXAMPLE OF SELF-CORRECTING SPELLING PROCEDURE

(correction of word merchant)

Merae

Merchnt

Merchan

Merchent

Merchunt

Ti Mer

Ci Mur

Si Mar

Mir

Mor

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LEARNING & DEVELOPMENT CENTER

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RE: KING COFFEE

On March 15, 1979 an optometric vision therapy program was completed with King Coffee. King was seen for 22 one and one quarter hour therapy visits beginning July 13, 1978.

Results

1. Suppression of right eye and intermittent double vision and visual stress were eliminated. Binocular coordination was stabilized. Visual tracking skills improved.

2. Visual acuity was increased to 20/20 in each eye.

3. Hand-eye coordination was improved.

4. Fine motor coordination of hands, eye movements and tongue control was established. Articulation was improved.

5. Receptive and expressive auditory reversals were eliminated. Short term auditory memory and sequentialization was improved. Word retrieval remained a problem.

6. Parts-whole integration in visual and auditory processing thinking were established.

Summary

King became considerably more efficient in those cognitive strategies believed to be inherent in the right hemisphere. This includes divergent, visual, spatial, holistic, concrete thinking. Some improvement in left hemispheric skills of convergent, verbal, detail (parts), logical, abstract and analytic thinking were noted.

King was able to apply and translate these skills into reading tasks. Significant gains in reading levels were achieved.

These findings were consistent with hemispheric testing for lateralization of cerebral function performed by an independent tester.

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